

REMARKS

Applicants thank the Examiner for the very thorough consideration given the present application. Claims 1-29 remain in the application and claims 1 and 25 are independent.

The Final Office Action dated April 7, 2009 has been received and carefully reviewed. Each issue raised in the Office Action is addressed below. Reconsideration and allowance of the present application are respectfully requested in view of the following remarks.

Examiner Interview

Following the receipt of the Final Office Action, Applicants requested an Interview with Examiner Richard Z. Zhu to discuss the rejections of record. Applicants and Applicants' representative, Mr. Paul T. Sewell, wish to thank Examiner Zhu for the courtesies extended to Applicants' representative during the personal interview, which was conducted on June 3, 2009. During the Interview we reviewed the features of the invention and the claim construction of the independent claims. We then discussed in considerable detail the features of the Hamamichi and Soma references. We requested the Examiner explain as to how Hamamichi might be interpreted as showing both the structure and steps recited in the claims, including, but not limited to:

an image density correction control unit for forming a reference developing image based on a set value of a predetermined image forming condition, detecting a density of the formed reference developing image, and correcting the set value,

a determination step for determining whether or not a set value of an image forming condition has been corrected beyond a predetermined range with respect to an initial value;

a humidity detection step for detecting humidity by the humidity detecting unit when a determination is made in the determination step that a correction value with respect to the initial value exceeds the predetermined range;

a correction value determination step for determining a correction value of the toner density reference value, based on the humidity detected in the humidity detection step; and

a step of correcting the toner density reference value using the correction value of the toner density reference value determined in the correction value determination step.

Examiner Zhu was most generous and gracious in spending a great deal of time and effort during the Interview, in attempting to read these features on the second embodiment of Hamamichi described in column 7, line 17, through column 8, line 43, and in particular on the humidity regulating controls and flow chart shown in Figures 10 and 11, and on the charge amount control Q described in Figure 12. At the end of the Interview, however, Examiner Zhu admitted that he was unable to read the above listed claim limitations on the claimed features of Hamamichi and Soma as applied, and would likely have to withdraw the rejection. He further indicated he would need to update his prior art search to make certain that his search was complete before indicating allowability. Applicants greatly appreciate Examiner Zhu's willingness to discuss the merits of the rejections at length, as well as his indication that the claims of record avoid the applied prior art. Responsive to Examiner Zhu's indications, Applicants respectfully recapitulate herein the arguments presented in the Interview and incorporate the arguments made previously in the previous Request for Reconsideration filed January 6, 2009, in the arguments to follow. The above constitutes Applicants' statement of the substance of the Interview responsive to the requirement for same contained on the Interview Summary PTOL-413.

Claim Rejections – 35 U.S.C. § 103

The Final Office Action dated April 7, 2009 has repeated the rejections from the prior Office Action and provides additional details as to the manner in which the Examiner is interpreting the claim limitations. Claims 1-17, 25 and 26 stand rejected under 35 U.S.C. § 103(a) as allegedly unpatentable over Hamamichi in view of Soma. Claims 18-22 stand rejected under 35 U.S.C. § 103(a) as allegedly unpatentable over Hamamichi in view of Soma, and further in view of Asanuma. Claims 23 and 24 stand under 35 U.S.C. § 103(a) as allegedly unpatentable over Hamamichi in view of Soma, and further in view of AAPA. Claim 27 stands under 35 U.S.C. § 103(a) as allegedly unpatentable over Hamamichi in view of Soma, and further in view of Fukuchi. Claims 28 and 29 stand under 35 U.S.C. § 103(a) as allegedly unpatentable over Hamamichi in view of Soma, and further in view of Fukuchi and Asanuma.

According to this further explanation it appears the rejection proposes several alternative interpretations of the claim limitations as reading upon the combination of Hamamichi and Soma.

The Office Action relies upon either AIDC sensor 800 or ATDC sensors 600 of Hamamichi for a toner density detecting unit for detecting toner density in the developing unit 45. To the contrary, AIDC sensor 800 in the second embodiment shown in Figure 9, senses the density ID of the developed image on the photosensitive drum 41, and does not detect the “toner density in the developing unit” as required by claims 1 and 25. The Examiner asserts the toner density in the test pattern is “substantially detecting toner density in the developing unit by testing a sample of the toner contained in the developing unit.” There is no basis for this conclusion as toner density at the drum 41 is influenced by many other factors such as, cleaning efficiency, transfer efficiency, transfer voltage and laser focus, and therefore density of the test pattern is not a detection of toner density in the developing unit.

The ATDC sensors 600, referenced by Examiner Zhu during the interview, in the fifth embodiment shown in Figure 15, have been alleged as detecting a “toner volume density” in the developing unit. However, Hamamichi makes clear in column 9, lines 35-41, the fifth embodiment substitutes the ATDC sensors 600 for the AIDC sensor 800 because the fifth embodiment wants to suppress consumption of toner used in the second embodiment. These are two different embodiments and there is no disclosure or suggestion for combining them. Therefore, there is no teaching or suggesting of combining a toner density detecting unit for detecting toner density in the developing means with a humidity detecting unit for detecting humidity information around the developing unit, and then controlling the toner supply unit by comparing an output value from the toner density detecting unit with a toner density reference value and an image density correction control unit for forming a reference visible image and detecting the density of the formed reference visible image. The rejection incorrectly combines features from two different embodiments within Hamamichi which are not disclosed as usable together, and in which the fifth embodiment desires not to be used with the test print image detector of the second embodiment.

Further, during the Interview, some of the features of the method and apparatus of the present invention were listed as:

- forming a reference developing image based on a set value of a predetermined image forming condition

- detecting a density of the formed reference developing image

- correcting the set value

- detecting a humidity in the vicinity of a developing unit when the set value exceeds a predetermined range with respect to the an initial value

- determining a toner density reference value to be used for control of toner supply to the developing unit based on the detected humidity, and

- thereby realizing appropriate correction of the toner density reference value with respect to humidity change.

The features of Hamamichi were discussed as including:

- detecting characteristics relating to humidity on an image forming mechanism

- controlling the humidity around the image forming mechanism in accordance with the detected characteristics to improve image formation.

So even if the voltage measurement of V_s in Hamamichi is construed to be a set value, there is no: an image density correction control unit for forming a reference developing image based on a set value of a predetermined image forming condition, detecting a density of the formed reference developing image, and correcting the set value, a determination step for determining whether or not a set value of an image forming condition has been corrected beyond a predetermined range with respect to an initial value; a humidity detection step for detecting humidity by the humidity detecting unit when a determination is made in the determination step that a correction value with respect to the initial value exceeds the predetermined range; a correction value determination step for determining a correction value of the toner density reference value, based on the humidity detected in the humidity detection step; and a step of correcting the toner density reference value using the correction value of the toner density

reference value determined in the correction value determination step, as required by claim 1, and claim 25 for similar reasons.

The features of Soma include:

when a wait time for printing has elapsed after a long period,
detecting concentration of developing liquid and
adding additional supply of developing liquid after developing liquid is stirred.

The goal is to form high-quality images, but the present application and the applied references all do so by different methods. In the present invention, *inter alia*, toner supply to the developing unit is adjusted, but in Hamamichi the device controls the humidity around the image forming mechanism. Even if Soma were incorporated into Hamamichi it would not operate in the manner claimed herein.

For the Examiner's convenience, the full request for reconsideration previously filed January 6, 2009 is reproduced *in toto* below.

Claim Rejections – 35 U.S.C. § 103

Claims 1-17, 25 and 26 stand rejected under 35 U.S.C. § 103(a) as unpatentable over U.S. Pat. No. 5,539,500 to Hamamichi et al. ("Hamamichi") in view of U.S. Pat. No. 4,141,646 to Soma et al. ("Soma"). Applicants submit the Examiner has failed to establish a *prima facie* case of obviousness and respectfully traverse the rejection. A complete discussion of the Examiner's rejection is set forth in the Office Action, and is not being repeated here.

In order to establish a *prima facie* case of obviousness under 35 U.S.C. § 103(a), the cited references must teach or suggest each and every element in the claims. *See M.P.E.P. § 706.02(j); M.P.E.P. 2141-2144.*

Applicants respectfully submit that this combination of elements as set forth in independent claims 1 and 25 is not disclosed or made obvious by the prior art of record, including Hamamichi and Soma. Applicants will respond based upon a detailed analysis of claim 25, as the Examiner has done, noting that claim 1 parallels the structure of claim 25, and adds determination, detection and correction steps.

One of the important features of the invention, as is described in general terms in the paragraph bridging pages 12 and 13 of the specification, is that because the toner density reference value is corrected based upon a correction value of the currently set value with respect to the initial value of the set value of the image forming condition, instead of a correction value of the currently set value with respect to the previous set value of the image forming condition, the developability changes gradually based on a humidity change. Therefore, even when the correction value of the currently set value with respect to the previous set value of the image forming condition is small, it is possible to correct the toner density, hold the appropriate toner density in the developing device, stabilize the developability and form stable, high-quality images.

The Examiner appears to assert that one of ordinary skill in the art would have applied the technology of “toner supply” in Soma to the device of Hamamichi. Applicants assert this combination is inappropriate and unreasonable for the following reasons.

The Examiner states that Hamamichi discloses an image forming apparatus comprising a developing unit 45a-45d; a toner density detecting unit AIDC sensor 800 in Figure 9 and 10 or ATDC sensors 601a-601d in Figure 15 for detecting a toner density in the developing unit; a humidity detecting unit 300 in Figure 4 for detecting humidity information around the developing unit; an image density correction control unit CPU 900 in Figure 10 in coordination with AIDC sensor 800 for forming a reference visible image based on a set value of a predetermined image forming condition, detecting a density of the formed reference visible image, and correcting the set value; a judging unit CPU 900 for determining whether or not a set value of an image forming condition has been corrected beyond a predetermined range with respect to an initial value; a detecting unit CPU 900 in conjunction with humidity controller 400 and humidity sensor 300 for detecting a humidity change by monitoring an output of the humidity detecting unit, when said unit determines that a correction value with respect to the initial value exceeds the predetermined range; a determining unit CPU 900 functioning as described in column 8, lines 8-18, for determining a correction value of the toner density reference value, based on the humidity change detected by the detecting unit; and a correcting unit AIDC sensor 800 as described in column 7, lines 44-45, for correcting the toner density reference value using the correction value determined by the determining unit.

The Examiner depends upon “an AIDC sensor” and “an ATDC sensor” of Hamamichi as “the toner density detecting unit” in the instant claims. This “AIDC sensor” is for detecting image density, and therefore is totally different from the “toner density detecting unit” of the present invention. Moreover, the “ATDC sensor” is for detecting volume density, and therefore is also different from the “the toner density detecting unit” of the present invention. More specifically, Applicants respectfully submit that AIDC sensor does not detect a toner density in the developing unit as it instead merely detects the density ID of the developed image formed on the surface of the photosensitive drum, as described in column 7, lines 27-34, and ATDC sensors 601a-601d are of the magnetic type for detecting the “volume density of the two-component developing materials,” column 9, lines 12-16, and work by “detecting the permeability of the developing material,” column 9, lines 23-25. Detecting the volume density is not the same as detecting the toner density as claimed. In addition, Hamamichi does not disclose storing a toner density reference value in a memory unit, as CPU 900 is merely looking to see if the image density is outside of a permissible range. There is no determining unit for determining a correction value of the toner density reference value, based on the humidity change detected by the detecting unit; and there is no correcting unit for correcting the toner density reference value using the correction value determined by the determining unit. Hamamichi merely turns on the humidifier or dehumidifier if the image density falls outside of a permissible range. There is no correction to a toner density reference value.

Furthermore, Hamamichi fails to disclose “determining whether or not a set value of an image forming condition has been corrected beyond a predetermined range with respect to an initial value.” The portion referred to by the Examiner at column 8, lines 8-18, only describes that an output value of image density of a developed test pattern is compared with a predetermined value. Moreover, there is no concept in Hamamichi of “an initial value” which is an important aspect of the present invention.

Hamamichi fails to disclose “detecting humidity by the humidity detecting unit when a determination is made that a correction value with respect to the initial value exceeds the predetermined range” as in claim 1 and “detecting a humidity change by monitoring an output of the humidity detecting unit” in claim 25. Hamamichi only describes periodically measuring

humidity in an area around a developing unit and adjusting the humidity based on the measured result.

Hamamichi fails to disclose “determining a correction value of the toner density reference value, based on the detected humidity” in claim 1 and “determining a correction value of the toner density reference value, based on the detected humidity change.” The portion referenced by the Examiner at column 8, lines 8-18, only describes that an output value of image density of a developed test pattern is compared with a predetermined value.

According to the Office Action, Soma is relied upon for detecting concentration of a developing liquid in a liquid development image formation apparatus, and sensing concentration of developing liquid at column 3, lines 1-10 and column 4, lines 38-41, and using a toner supply unit for supplying toner at column 4, line 44, through column 5, line 2.

To the contrary, Soma does not remedy the defects of Hamamichi discussed above. Soma discloses detecting density of developing liquid in a developing device and supplying toner based on the detected value. However, there is no disclosure concerning humidity in an area around the developing device. Accordingly, there is no motivation for combining Hamamichi with Soma. Also, even with this combination, a person having ordinary skill in the art would have had no motivation for “detecting humidity in an area around the developing unit when a set value of an image forming condition has been corrected beyond a predetermined range with respect to an initial value, and determining a correction value of a toner density reference value, based on the detected result” as in the present invention.

In this invention, since the toner density reference value is corrected based on a correction value of the currently set value with respect to the initial value of the set value of the image forming condition instead of a correction value of the currently set value with respect to the previously set value of the image forming condition, the developability changes gradually based on a humidity change. Therefore, even when the correction value of the currently set value with respect to the previous set value of the image forming condition is small, it is possible to correct the toner density, constantly and with certainty hold the appropriate toner density in the developing device, stabilize the developability and form stable high-quality images, as explained in the specification.

Applicants respectfully submit that the combination of elements as set forth in independent claims 1 and 25 is not disclosed or made obvious by the prior art of record, including Hamamichi and Soma, for the reasons explained above. Accordingly, reconsideration and withdrawal of this rejection are respectfully requested. With regard to dependent claims 2-17 and 26, Applicants submit that claims 2-17 and 26 depend, either directly or indirectly, from independent claims 1 or 25 which are allowable for the reasons set forth above, and therefore claims 2-17 and 26 are allowable based on their dependence from claims 1 and 25. Reconsideration and allowance thereof are respectfully requested.

Claims 18-22 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Hamamichi in view of Soma, and further in view of U.S. Pat. No. 5,216,470 to Asanuma et al. (“Asanuma”). This rejection is respectfully traversed.

According to the Office Action, Asanuma is used as a teaching for measuring a continuous supply time in which the toner is continuously supplied at column 4, lines 1-20, and determining whether or not the measured continuous supply time exceeds a predetermined supply time at column 4, lines 1-20. To the contrary, Asanuma is not measuring a continuous supply time, as it is instead performing repeated sampling of toner density for a period long enough to ensure that the average “can be accurately determined” at column 4, line 17. Asanuma makes clear in column 6, at lines 9-32, that toner may be supplied, but only until the desired concentration is sensed at Q1 and Q2 and the circuit does not measure a continuous supply time and does not restrict image formation if the continuous supply time exceeds the predetermined time. Moreover, Asanuma fails to remedy the defects of Hamamichi and Soma discussed above as it fails to show or suggest the several claim limitations discussed in detail above, the details of which are incorporated herein. Reconsideration and allowance thereof are respectfully requested.

Claims 23 and 24 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Hamamichi in view of Soma, and further in view of Applicant’s Admitted Prior Art (“AAPA”). This rejection is respectfully traversed.

The AAPA is relied upon for toner particle average diameters and concentrations. However, AAPA fails to remedy the defects of Hamamichi and Soma discussed above, as it fails

to show or suggest the several claim limitations discussed in detail above, the arguments of which are incorporated herein. Reconsideration and allowance thereof are respectfully requested.

Claim 27 stands rejected under 35 U.S.C. § 103(a) as unpatentable over Hamamichi in view of Soma, and further in view of U.S. Pat. No. 5,126,789 to Fukuchi et al. ("Fukuchi"). This rejection is respectfully traversed.

According to the Office Action, Fukuchi is cited for its showing of a detachable toner container 15 in Figure 1 and 31, behind access cover 13. However, Fukuchi fails to remedy the defects of Hamamichi and Soma discussed above, as it fails to show or suggest the several claim limitations discussed in detail above, the arguments of which are incorporated herein. Reconsideration and allowance thereof are respectfully requested.

Claims 28 and 29 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Hamamichi in view of Soma, and further in view of Fukuchi and Asanuma. This rejection is respectfully traversed.

The teachings of Fukuchi and Asanuma have been discussed above with respect to the rejections of claims 18-22 and 27, and are incorporated herein. Fukuchi and Asanuma taken collectively fail to remedy the defects of Hamamichi and Soma discussed above, as it fails to show or suggest the claim limitations discussed in detail above, the arguments of which are incorporated herein. Reconsideration and allowance thereof are respectfully requested.

Conclusion

All objections and rejections raised in the Office Action having been properly traversed and addressed, it is respectfully submitted that the present application is in condition for allowance. Applicants therefore respectfully request that the Examiner reconsider all presently outstanding rejections and that they be withdrawn. It is believed that a full and complete response has been made to the outstanding Office Action, and as such, the present application is in condition for allowance. Notice of same is earnestly solicited.

Prompt and favorable consideration of this Amendment is respectfully requested.

If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is invited to telephone Paul T. Sewell, Registration No. 61,784, at (703) 205-8000, in the Washington, D.C. area.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.14; particularly, extension of time fees.

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Respectfully submitted,

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